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FRIENDLY FIRE: WILL WE GET IT RIGHT THIS TIME

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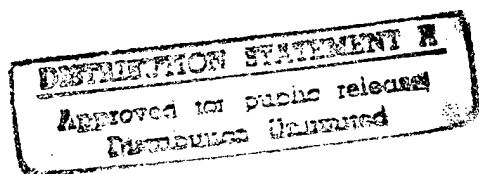
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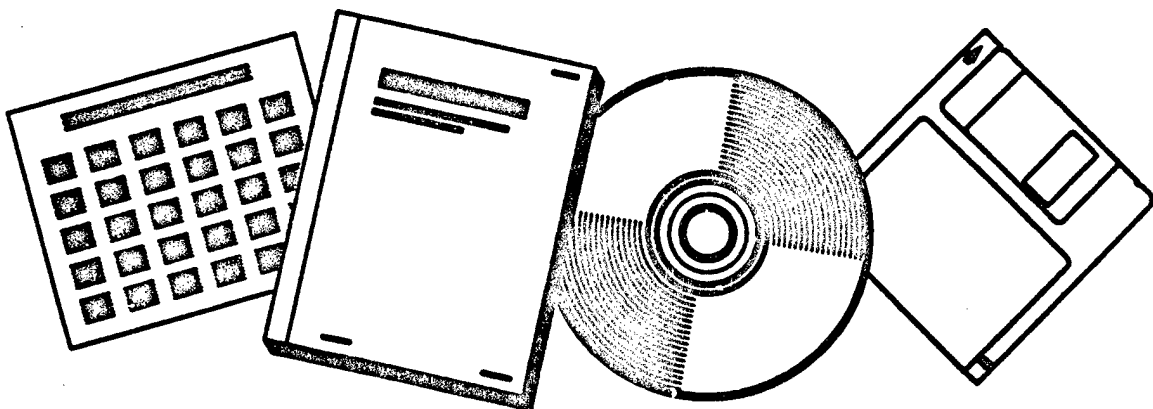
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BIBLIOGRAPHIC INFORMATION

Abstract: The report discusses: Review of friendly fire in combat casualty surveys: Reassuring numbers such as 'two percent' prevalence are nonsense. the casualty surveys demonstrate rates five. possibly ten times as great: and A risk of fratricide attaches to every weapon that is taken into battle.

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                                                       Not applicable

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Unlimited

1. Review of friendly fire in combat casualty surveys.

2. Reassuring numbers such as "two percent" prevalence are nonsense; the
   casualty surveys demonstrate rates five, possibly ten times as great.

3. A risk of fratricide attaches to every weapon that is taken into battle.

Friendly fire - fratricide - amicicide - casualties -   17
casualty survey - attrition - Merrill's Marauders - Bougainville

Unclassified   Unclassified   Unclassified   UL

FRIENDLY FIRE: WILL WE GET IT RIGHT THIS TIME?

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PURPOSE. The purpose of this communication is to reduce combat casualties. The Army needs to be reintroduced to a continuity of studies, begun during World War II and still being applied, known technically as "combat casualty surveys". The studies are collaborations between the Medical Department and the combat arms. They have been in the open literature for as long as 30 years. One component of these casualty surveys, concerning the distribution of war wounds and the wounding agents, helped drive a reluctant Army to develop and adopt individual protective armor. Another component, however, concerning how casualties occur, and within that. how U.S. casualties are caused by U.S. fire, has been ignored by the leaders. The result is that the concept base of policies to reduce fratricide remains to this day contrary to the best information we have[1].

FRIENDLY FIRE IN ODS. During Operation Desert Storm (ODS) U.S. forces suffered 613 military battle casualties, 146 killed in action (KIA) or died of wounds (DOW), and 467 wounded in action (WIA). Of the 146 KIA, 35 were caused by "fire from friendly forces" and, of the 467 wounded, 72. All these counts are from the Department of Defense *Final Report to the Congress*; without ever stating what the experience in "previous conflicts" might be, the *Final Report* continues:

> Three factors help explain the higher proportion of casualties from friendly fire in Operation Desert Storm as opposed to previous conflicts. First, a more thorough investigation of these incidents was possible in Operation Desert Storm. The war was short, the number of incidents few, and more sophisticated investigations were conducted. Second, fire from friendly forces may loom large principally because the total number of casualties was so small. A third factor is the duration of the conflict. Some incidents occurred because of the lack of battle experience among frontline troops. One could expect this type incident to decrease markedly as experience grew[2].

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[1] Army and Army Air Force combat casualty surveys, from World War II through the Korean War, for which documents survived, were edited by MAJ James C. Beyer, MC, as one volume of the series *Medical Department United States Army in World War II*. Dr. Beyer undertook this as a special project while also a resident in pathology at Fitzsimons Army Medical Center; his resourcing consisted mostly of "a tolerant chief" (Beyer interview with author, Alexandria, VA, July 30, 1992): James C. Beyer, ed., *Wound Ballistics*, Office of The Surgeon General, Department of the Army, Washington, D.C., 1962. This collection will be cited as "*Wound Ballistics*". The Vietnam casualty survey is: Joint Technical Coordinating Group for Munitions Effectiveness, *Evaluation of Wound Data and Munitions Effectiveness in Vietnam*, Aberdeen Proving Ground, MD. 1970. It is available from Defense Technical Information Center, Document Numbers AD 879-516L and AD 879-517L. It will be cited as "*WDMET*", and then as paginated in the original, which is by chapter: thus "2-4" signifies page 4 of Chapter 2.

[2] Department of Defense, *Conduct of the Persian Gulf War, Final Report to the Congress*, April 1992, Appendix M, pp. M-1 and M-2. This will be cited as "*Final Report*".

Or, in discussion of the same casualty numbers, attributed to "a military historian and statistician":

> This is the first time in all of military history that there's been a serious effort to determine all of the casualties caused by friendly fire[3].

HISTORIC PREVALENCE. There is no doctrinal friendly fire proportion or, for that matter, any doctrinal casualty rate. Official statements and training materials since ODS have avoided mention of numbers[4]. The background which appeared in the newspaper articles in August 1991[5], when Department of Defense released the statistics which eventually became part of the *Final Report to the Congress*, was provided by the reporters, not the briefers[6]. Nevertheless, while there is no doctrine, there are authoritative statements, and they all seem to be in agreement with each other. The most frequently cited is a 1982 compilation of friendly fire incident reports, World War I through Vietnam, from the Combat Studies Institute at the Command and General Staff College, by LTC C.R. Shrader, titled *Amicicide: The Problem of Friendly Fire in Modern War*. LTC Shrader's conclusion is, "It appears that amicicide incidents account for something less than 2 percent of all casualties in battle"[7]. In a 1990 monograph on modeling casualties and equipment loss in combat, COL Trevor N. Dupuy states, "The average proportion [of friendly fire] is more likely no more than 2 percent of the casualties incurred"[8]. As late as July 1992, discussions in *Military Review* adhered to the notion of 2 percent[9]. (The path of "2 percent" into U.S. military doctrine is discussed in Appendix A.)

DEFINITIONS. The recognition of friendly fire casualties is not new. "It's always the case, we always lose more men by our own people than we do by the enemy", states a British cavalry colonel looking at his battle-site after Waterloo[10]. Establishing the prevalence, the percent occurrence of these casualties among the total killed or wounded in combat, has been entirely

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[3]Sean D. Naylor, "Friendly Fire: The Reckoning", *Army Times*, August 26, 1991, p.4. The attribution is to COL Trevor N. Dupuy. I have not verified the attribution; historians tend to avoid "first time in all . . . history".

[4]Estimates of prevalence are absent from the Combat Identification Program *Interim Report*, December 12, 1991; and from Fratricide Risk Assessment for Company Leadership", *Center for Army Lessons Learned (CALL) Handbook*, No. 92-3, March 1992. ODS prevalence is mentioned, and dismissed as "not necessarily the best historical means to record fratricide", in "Fratricide: Reducing Self-Inflicted Losses", *CALL Newsletter*, No. 92-4, April 1992, p. 5.

[5]For example, Barton Gellman, "Gulf War's Friendly Fire Tally Triples", *Washington Post*, August 14, 1991.

[6]Telephone interview with briefer, COL Roger A. Brown FA, DAMO-FDZ, August 16, 1991.

[7]Charles R. Shrader, *Amicicide: The Problem of Friendly Fire in Modern War*, Research Survey No. 1, U.S. Army Command and General Staff College, Combat Studies Institute, 1982, p. 105. The General Officer briefing the *Interim Report* (note 4, above) refers to this as "the primary historical work".

[8]Trevor N. Dupuy, *Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War*, Hero Books, Fairfax, VA, 1990, p. 3.

[9]Dwight B. Dickson, Jr. and Elrin L. Hundley, "Avoiding Not So Friendly Fire", *Military Review*, July 1992, p.57.

[10]Cited in John Keegan, *The Face of Battle*, Viking, New York, 1976, p. 193.

another matter. The U.S. Army has not practiced a uniform classification of casualties in any war in this century. During World War II, weapons cleaning accidents, munitions malfunctions, training accidents and suicides (particularly if any of these occurred in or close to a combat zone) were often reported as combat casualties and therefore entered overall Army statistics as casualties due to hostile action. When combat casualty surveys were done, accidents and malfunctions were considered and sometimes included in the count under "friendly fire". By the Vietnam War, accidents during maintenance and training were more consistently segregated from combat deaths, and were not candidates for the combat casualty surveys. After ODS, the definition which structured reporting of friendly fire casualties, and which governs present efforts at control, was formulated by Training and Doctrine Command (TRADOC). It is the most restrictive definition I have encountered:

> Fratricide is the employment of friendly weapons and munitions with the intent to kill the enemy or destroy his equipment or facilities, which results in unforeseen and unintentional death or injury to friendly personnel[11].

In this communication, I will work as accurately as I can within the TRADOC "Fratricide Action Plan" definition. I will use the terms "friendly fire" and "fratricide" interchangeably.

FRIENDLY FIRE IN CASUALTY SURVEYS: Operation Desert Storm created a roster of casualties we could get our arms around. That's a good working definition of a "casualty survey": a war fight which makes sense in itself, in which all the casualties are identified, and in which enough is known about each casualty to derive meaningful conclusions. Casualty surveys are rare, but ODS was not "the first time in all military history". Besides ODS, there are five others. None should be obscure. Four required significant commitment of resources and command coordination by the Army as an institution. The fifth was an individual initiative by a Medical Corps Captain, but out of one the most controversial and most studied units of World War II, the 5307th Composite Unit (Provisional), otherwise "Merrill's Marauders". Up to September 1992, none has been mentioned in any paper on friendly fire, fratricide, or amicicide[12]. The friendly fire casualty data from these surveys is displayed at Table 1 and Table 2.

A casualty survey reaches all casualties of a defined fight (this is the denominator of the prevalence fraction), and determines by positive identification the origin of each wounding (the friendly fire casualties are the numerator). Interviews with the casualty and witnesses of the engagement remain the most productive and reliable sources of information. Identification of missiles even by direct exam is often inconclusive, unless they have exceptional signatures such as depleted uranium or Soviet cast iron. A casualty list which does not attempt positive identification of the origin of each wounding agent, and investigates only those which are suspicious, for example air-to-ground when we control the sky, or casualties in M1 tanks when only friendly forces have the resources to defeat an M1, is a collection of incident reports, not

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[11]U.S. Army TRADOC, "Fratricide Action Plan", in *CALL Newsletter*, No. 92-4, April 92, p. 3.

[12]Three of these surveys, and summaries of their cases, are published in *Wound Ballistics*: James E. T. Hopkins, "Casualty Survey - New Georgia and Burma Campaigns", pp. 237-80 and 769-806, Ashley W. Oughterson, *et al.*, "Study on Wound Ballistics - Bougainville Campaign", pp. 281-436. Bougainville is two surveys, an autopsy series within a larger series of combat casualties. Two surveys are published in *WDMET*: The overall study, and within it (Chapter 2), the 500-autopsy series.

a casualty survey. Such a collection (whose individual casualty data can be very valuable, and just as reliable as the individual data in a survey) defines the minimum prevalence of friendly fire casualties in that fight. It does not define the whole story. Absent a statement that every casualty in ODS had such a determination, the statistics in the *Final Report to the Congress* are minimums.

CASUALTY SURVEYS - PREVALENCE IS A LARGE NUMBER. The first survey of "U.S. casualties caused by U.S. weapons fired by U.S. soldiers" was the initiative of a battalion surgeon, Captain James Hopkins. Understanding the circumstances of Dr. Hopkins's work is critical to understanding the reliability of his data, and to evaluating the coherence of casualty surveys in general. Dr. Hopkins graduated from an internship in surgery at Johns Hopkins Hospital in 1942, and came immediately on active duty. His first assignment was to the 18th General Hospital (Johns Hopkins University cadre) on Fiji, which was receiving casualties from Guadalcanal. He then volunteered for duty on Guadalcanal itself, and was assigned to the 117th Engineers. During this time, he was developing a sense of the spectrum of combat casualties; he was also developing working relations with small-unit commanders which informed his concern over how such casualties might be reduced. Dr. Hopkins's particular interest was, and remained, body armor, not friendly fire. In early 1943, he transferred to the 37th Infantry Division (ID) of the Ohio National Guard, and he served as battalion surgeon to the soldiers of this division until he left the Pacific and China-India-Burma theaters in late 1944. The continuity of his relationship is not immediately apparent, but volunteers from the 37th ID, Hopkins among them (told only it was for "an unusual mission"), were folded into two of the three battalions of the 5307th Composite. With these soldiers he marched "single file across Burma", and was in the last party of the original force to be evacuated, in May 1944, to India. Hopkins's casualty surveys - how do soldiers become casualties, and what can be done about it - comprise two periods of action: eighteen days of jungle perimeter development and defence by the 1st Battalion, 148th Infantry on New Georgia Island, and four months "spearheading the Chinese movement into North Burma" from the Ledo Road to Myitkyina Airfield by the 3rd and 1st Battalions of the 5307th.

During each of these campaigns, Hopkins was able to keep a diary of the casualties reaching the Battalion Aid Station (BAS). There was no cross-evacuation at this level, and no overflying or skipping echelons of early care (although air evacuation was a major resource in Burma). He knew the men, and he knew the officers; a half-century later, he still recalls the casualties by name. Each period of combat was followed by the concentration of the battalions in a rest area (on Guadalcanal after New Georgia, and in India after Burma) for one to two months. During this time, Hopkins was able to interview survivors and complete information he had missed in the field. The data collection was standardized on a survey instrument recording wound diagnosis, type of action, treatment, disposition, and opinion on preventability.

Hopkins rotated back to the U.S. Through the cooperation of an air movements clerk in Cairo, he was able to carry the case records with him. During October-November of 1944, he was given resources at the Surgeon General's Office in Washington to retrieve the individual medical records that contained the follow-up information not available at the rest camps. His

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report of the casualty survey was complete by 1945. It was known within the combat care and wound research community, and was initially classified. It was finally published in 1962[13].

The initial battalion strengths of Hopkins's three units were 800 - 1000. Hopkins entered 370 casualties in his survey. Of the 370, 102 were KIA/DOW, and 268 were WIA. Friendly fire - "U.S. casualties caused by U.S. weapons fired by U.S. soldiers"[14], is Hopkins's own definition - killed 16 percent of the KIA, and wounded 19 percent of the WIA, an overall rate of 18 percent of casualties[15]. CPT Hopkins is the first to emphasize this finding: "It is doubtful that higher command is aware that U.S. soldiers killed and wounded such a large proportion of their fellow soldiers as these figures suggest". Dr. Hopkins states that he recalls no questions or particular comment, in 1944-5 or later, over this aspect of his report[16].

As I have described, the TRADOC definition of a fratricide casualty is not the one used by Hopkins, or the one in general use during World War II. TRADOC requires "intent to kill the enemy". However, CPT Hopkins's case records are in print, and can be reviewed to exclude such casualties as the soldier who injured himself when the trigger of his Thompson submachine gun caught on a twig, and the several cleaning accidents, in short, to standardize the study cases on the present TRADOC definition so that they can be compared to the ODS statistics. The numbers then become 353 cases in the survey, 13 percent of KIA and 14 percent of WIA, overall 14 percent of casualties due to friendly fire. They are not 2 percent.

The next two studies were set in a beachhead perimeter defence on Bougainville Island during sixty-six days of February - April 1944, by two divisions, the 37th ID again (now minus its volunteers to Burma) and the Americal. This casualty survey was resourced with three surgeons, a pathologist, three technicians (for stenography and photography), and augmented with hospital and Corps-level Ordnance staff[17].

The evacuation structure of the perimeter battles favored the survey. All battle casualties who were not "immediately" returned to duty from the division medical formations (BAS or collecting station) were evacuated to the 21st Evacuation Hospital (University of Oklahoma cadre), to which the survey team was attached. Immediacy reinforced the accuracy

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[13]Hopkins's history and method are recorded in *Wound Ballistics*, especially pp 237-53, and interview with author, Baltimore, MD, August 20, 1992. The history of the reports on the medical condition of the 5307th, from their suppression by the theater command and by one future Surgeon General, to their official publication as "a primer for medical plans and operations" by another Surgeon General is in: James H. Stone, ed., *Crisis Fleeting*, Office of The Surgeon General, Department of the Army, Washington, D.C., 1969, see index under "Armstrong, COL George E.", and "Foreword" by LTG Leonard Heaton. While Hopkins's reports were among those suppressed, friendly fire was not part of the content of those reports and did not play a part in the controversy. A contemporary appreciation of Hopkins by his unit is in *Crisis Fleeting*, pp. 330-1.

[14]*Wound Ballistics*, p. 264.

[15]See Table 1, Line 1a. All further statistics in this section are displayed in Table 1, and documented in the Table 1 "Source Notes".

[16]*Wound Ballistics*, p. 277, and Hopkins interview.

[17]*Wound Ballistics*, pp. 281n, 369n, and 434-6.

of data collection; 87 percent of a series of casualties were on an operating table within three hours of wounding[18].

There are 1738 cases, defined as "combatants who were killed or wounded by weapons", in the Bougainville survey, 395 KIA/DOW, and 1393 WIA. Of these, 16 percent of the KIA and 11 percent of the WIA were assigned by the team to "due to U.S. weapons in the hands of U.S. troops". The overall prevalence is 12 percent[19]. Again, as with Hopkins, it is possible to standardize the Bougainville statistics on the TRADOC definition by excluding the self-inflicted casualties. The prevalence figures do not change significantly (Lines 2a and 2b of Table 1).

Because it was dedicated and resourced, the Bougainville team was able to identify friendly fire casualties by more methods than the interviews and immediate observation available to Hopkins: X-rays, Ordnance examination of recovered missiles, and autopsy. About one-quarter of the KIA in the Bougainville survey were examined by autopsy; the cases were selected by workload and the condition of the body when recovered[20]. This is not the most objective structure for a sample, but it does not have any apparent bias, for or against friendly fire. There are almost 100 cases in the autopsy series. Standardized to the TRADOC definition, 24 percent of these deaths were due to U.S. weapons.

The most extensive casualty survey on U.S. forces came out of the Vietnam War, and is known as the "WDMET study" - from *Wound Data and Munitions Effectiveness in Vietnam*. WDMET collected data from 1967 to 1969, and was resourced with a total (over the two years) of about 125 dedicated personnel, coming about equally from the Medical Department, and from Ordnance and combat branches. The intended mission of the survey teams was to study, by interview, collection of ordnance materiel, photographs, and real-time medical tracking, every casualty in battalion-sized engagements. The spread of the mission proved impossible to sustain in the field, but the scope of the data collection in each individual case was accomplished. All case records and artifacts were brought back to the U.S., and remain retrievable (on data tapes and in original copy) at the Casualty Care Research Center of the Uniformed Services University of the Health Sciences[21].

The Army WDMET accumulated 5993 cases from 1867 engagements, involving components of the 1st Cavalry Division, and 4th, 25th and 1st IDs. Within each engagement they tried to survey every casualty; and some of the engagements were indeed battalion-sized, as projected. But the WDMET study is, in the end, a very large collection of incident reports, and the authors caution that it is only as representative of all casualties in Vietnam as a study restricted by the complexity of the combat and medical tactics could be[22]. Furthermore,

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[18]*Wound Ballistics*, pp. 284-6.

[19]Definitions at *Wound Ballistics*, pp. 311 and 345.

[20]*Wound Ballistics*, p. 369.

[21]*WDMET*, pp. 1-5 through 1-25, and A-9 through A-12.

[22]*WDMET*, pp. 1-33 through 1-35.

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friendly fire was not among the planned "areas of interest" of the study, so that the friendly fire statistics were not collated as such in the final publication as they were by Hopkins, and for Bougainville[23]. However, the data on how the casualty occurred, and the wounding agent, were collected in the field, and remain easily retrievable in the case records. The only conclusion the personnel within the study have published is, "An unknown fraction of the [WDMET] population, but almost certainly more than 10 percent, were victims of friendly fire"[24].

The published data can be used to derive the proportion of friendly fire casualties in this collection of incident reports. All casualties in WDMET are assigned to one (occasionally more) of 18 types of weapons (plus one category for "Unknown"). Of these types, four are specific and extremely unlikely to have been in enemy hands: the M16 rifle, M79 grenade launcher, artillery, and the Claymore mine. These four weapons caused a total of 11 percent of U.S. casualties.

As there was an autopsy series within the Bougainville survey, there is also one within the Vietnam survey, on 500 Army KIA. This series is consecutive; no KIA entered in WDMET during the months of the autopsies was omitted. Using the same reasoning applied above, the four weapons accounted for 10 percent of U.S. KIA.

CASUALTY SURVEYS - RISK ATTACHES TO EVERY WEAPON. The Hopkins and Bougainville surveys present the role of individual U.S. weapons in U.S. casualties. (This data is in Table 2. "U.S. Weapons Involved in U.S. Casualties".) The data is also in WDMET, but allows only qualitative presentation. Every type of weapon carried by, or supporting, U.S. troops, is implicated in U.S. casualties. As new weapons, including combined arms, are added, the previous liabilities do not go away; instead, the new liabilities are layered on top of them.

There are incidents in the surveys which support the concern that new situations and inexperience are associated with friendly fire casualties. All the casualties of the first night on New Georgia (KIA-1, WIA-1) for example, were due to friendly fire[25]. There is, however, no evidence to support the reassurance that overall, friendly fire casualties decrease as battle experience accumulates.

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[23]WDMET, "Preface", p. 13.

[24]Ronald F. Bellamy et al., "Assessing the Effectiveness of Conventional Weapons", in Textbook of Military Medicine, Part I, Volume 5: Conventional Warfare Ballistic, Blast and Burn Injuries, 1991, p. 66. COL Bellamy, a thoracic surgeon, was not a member of the original WDMET. He is, however, the expert on its clinical content. Bellamy and CDR Joseph Henderson, Medical Corps, recognized the value of the WDMET archive in 1986 when it was about to be destroyed, and are responsible for its preservation.

[25]Wound Ballistics, p. 769.

SUMMARY. The combat casualty surveys have two messages for the concept base for the control of fratricide:

1. The absolute numbers of U.S. soldiers killed by U.S. weapons in U.S. hands are very high. Reassuring numbers such as two percent prevalence are nonsense; the surveys demonstrate a rate five, possibly ten times as great.

2. A risk of fratricide attaches to every weapon that is taken into battle.

[Tables and Appendices follow.]

Table 1: FRIENDLY FIRE DATA IN COMBAT CASUALTY SURVEYS - WORLD WAR II THROUGH ODS

LINE	SURVEY LOCATION/NAME Forces in survey	NO. OF CASES IN SURVEY	NO. OF CASES KIA + DOW	NO. OF CASES WIA	KIA + DOW BY FF No.	KIA + DOW BY FF %	WIA BY FF No.	WIA BY FF %	PREVALENCE: SURVEY DEFINITION	PREVALENCE: TRADOC DEFINITION	SOURCE NOTE
1a.	**NEW GEORGIA AND BURMA/HOPKINS** Jungle perimeter defense, one BN 37ID 18Jul-5Aug43. Spearhead across Burma, two BN 5307Comp 15Feb-8Jun44. (T1-1)	370	102	268	16	16	50	19	17.9%	14%	(T1-7)
1b.		353	99	254	13	13	36	14			(T1-8)
2a.	**BOUGAINVILLE** Beachhead perimeter defense 37ID and Americal 15Feb-21Apr44. (T1-2)	1788	395	1393	63	16	156	11	12.3%	12%	(T1-9)
2b.		1778	392	1386	60	15	149	11			(T1-10)
3a.	**BOUGAINVILLE AUTOPSY** 22Mar-21Apr44, 25% of all KIA + DOW within Bougainville survey. (T1-3)	99	99	0	30	30	0	0	Not computed.	24%	(T1-11)
3b.		91	91	0	22	24	0	0			(T1-12)
4a.	**VIETNAM WDMET** Components of 5 Army divisions Jun67-Jun69, preferably in offensive engagements. (T1-4)	5993	1279	4714	-		-		"almost certainly more than 10%" (T1-14)	11%	(T1-13)
4b.		5993	-	-	KIA + DOW + WIA = 667						(T1-15)
5a.	**VIETNAM WDMET AUTOPSY** Jul67-Nov68. 500 consecutive autopsies within VN WDMET. (T1-5)	500	500	0	-		0	0	Not reported.	10%	(T1-16)
5b.		500	500	0	51	10	0	0			(T1-17)
6a.	**OPERATION DESERT STORM** All US Forces, 17Jan-15Dec91. (T1-6)	613	146	467	35	-	72	-	Not reported.	17%	(T1-18)
6b.		613	146	467	35	24	72	15			(T1-18)

Within each survey, Line a. displays the data as presented in the original study. Line b. standardizes this same data to the current TRADOC definition of "fratricide."

Sources and methods of calculation are detailed in the Table 1 Notes (T1-1 through T1-18).

SOURCE and METHOD NOTES for TABLE 1
Friendly Fire Data in Combat Casualty Surveys

(T1-1)   *Wound Ballistics*, pp. 240, 247-8.

(T1-2)   *Wound Ballistics*, p. 281.

(T1-3)   *Wound Ballistics*, pp. 281, 369.

(T1-4)   *WDMET*, pp. 1-7 to 1-25.

(T1-5)   *WDMET*, p. 2-5.

(T1-6)   *Final Report to the Congress*, pp. M-1 and A-1. The list of "fatalities" in Appendix A covers 3 Aug 90 to 15 Dec 91. The end date of the analysis of "fire from friendly forces" in Appendix M is not stated.

(T1-7)   Line 1a. Hopkins analyses the two campaigns as a combined figure. The 369 cases in survey are based on *Wound Ballistics* pp. 253-5 and Table 31, after excluding 23 "minor wounds, no [further] record". Friendly fire casualties are at Table 43, p. 265. Author's conclusion is p. 277.

(T1-8)   Line 1b. Standardization to TRADOC definition of fratricide excludes from Line 1a 15 casualties by U.S. weapons, but not in contact with enemy (KIA-1, DOW-2, WIA-12), and 2 casualties by Chinese fire (both WIA). The casualties by U.S. weapons are described individually in the 393 case summaries in Appendices A-C (pp. 769-806). They include accidental discharges of small arms, cleaning accidents, sitting on bayonets, grenade explosions, and a soldier killed by an ammunition case which tore loose from its parachute. Prevalence under TRADOC definition is (KIA13 + WIA36)/(Cases in Survey 353) = 14%.

(T1-9)   Line 2a. 1788 cases based on *Wound Ballistics*, pp. 311-2, and Table 62, after excluding 547 WIA returned to duty "immediately" at the division level. Friendly fire casualties are at pp. 345-6 and Table 91. Author's conclusion is p. 345.

(T1-10)   Line 2b. TRADOC standardization excludes from Line 2a 10 self-inflicted casualties (KIA3, WIA7), p. 345.

(T1-11)   Line 3a. A total of 104 autopsies were performed; 5 of these were enemy (*Wound Ballistics*, p. 369). Of the remainder (99), 30 were allied soldiers (New Zealand and Fijian as well as U.S.) killed by allied weapons. (*Wound Ballistics*, "Autopsy Protocols," pp. 381-416.)

(T1-12)   Line 3b. TRADOC standardization excludes from Line 3a one U.S. self-inflicted (Case 53), and all Fijians and their New Zealand officers (a total of 7 - Cases 3, 12, 22, 29, 63, 72, and 100). Authors do not collate their fratricide information,

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except in the comparison (pp. 374-80) of the effectiveness of individual U.S. weapons versus Japanese counterparts.

(T1-13)   Line 4a. *WDMET*, Appendix C, p. C-6, Table 2, "WDMET - C Casualty Classification". Friendly fire data is collected on the interview form which is now archived as part of the case record, but was not entered on the data tapes ("WDMET Questionnaire", Appendix B, pp. B-39 to 44).

(T1-14)   R. F. Bellamy, *Textbook of Military Medicine*, Part I, Volume 5, p. 66.

(T1-15)   Line 4b. *WDMET*, Appendix C, p. C-7, Table 4, "Types of Weapons - Verified and Suspected", The total for the four U.S. weapons is 667, out of a total for all weapons of 6156, or 11% (some cases involved more than one weapon). The calculation is crude, but conservative and justifiable:
    a. By 1967, the enemy had standardized his small arms.
    b. Attribution of a U.S. casualty to U.S. arms in *WDMET* is a positive identification, not a default. "Claymore" means a U.S. Claymore and not generic anti-personnel mines, which are counted separately.
    c. "Unknown" is also a weapon category, total 289. No correction for this has been made in developing the fratricide statistic. The usual correction would be to reduce the denominator by 289, which would increase the prevalence.
    d. Finally, and most important, the calculation excludes entirely casualties by grenade and mortar (total 1406), which are major agents of fratricide. Differentiation of friendly from enemy grenades and mortars cannot be made from the unclassified Table 4.

(T1-16)   *WDMET*, pp. 2-5 to 2-21, "Five Hundred U.S. Army Combat Fatalities in Vietnam".

(T1-17)   *WDMET*, p. 2-17, Table 4, "Causative Missiles, 500 Fatalities". Same method and comments as note T1-15 (above) apply.

(T1-18)   *Final Report to the Congress*, p. M-1.

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Table 2: U.S. WEAPONS INVOLVED IN U.S. CASUALTIES
Percent of friendly fire casualties in each survey caused by weapon named.

WEAPON	NEW GEORGIA-BURMA (66 casualties)	BOUGAINVILLE (219 casualties)	WDMET (Not computed)
RIFLE	29	24	+
MACHINE GUN	5	1	+
GRENADE	12	9	+
M79 GRENADE LAUNCHER	-	-	+
MORTAR	23	16	+
MINE	-	15	+
CLAYMORE	-	-	+
ARTILLERY	26	19	+
ARMOR	-	-	-
BOMB - FRAG.	-	-	+
BOMB - NAPALM	-	-	+
MISC.	6	17	+
	~100%	~100%	
Source Note	(T2-1)	(T2-2)	(T2-3)

(T2-1) *Wound Ballistics*, p.264, Table 42, "Relative Lethal Effect of U.S. Weapons on 66 U.S. Casualties".

(T2-2) *Wound Ballistics*, p. 346, Table 92, "Relative Lethal Effect of U.S. Weapons on 219 U.S. Casualties".

(T2-3) *WDMET*, Appendix D, p. D-19, Table D.10-3, "Number of Casualties Wounded by Weapons of Various Types".

A statistic from a French casualty experience in World War I has been allowed to grow into an important justification for the low priority given to the study and correction of the problem of friendly fire.

1. PERCIN. Between the Armistice and his death in 1928, General Alexander Percin published several examinations of the cost of victory in the Great War[A-1]. Percin had been chief of staff to the War Minister (1900-04), and inspector-general of artillery training (1907-11). He was writing a polemic about his country's failure to resource his plans in the pre-war years, but he worked from excellent sources of information. One question he asked was why France had suffered so much larger a ratio of casualties (66 out of 100 combatants) than the loser Germany (41 out of 100)[A-2], and one element he identified in this excess loss was the systemic failure of the control of combined arms, which resulted in French artillery shelling their own troops[A-3]. How large was this element? Percin had information from a fellow general officer of a casualty survey in 1915 of rear hospitals, which showed that 2.2% of the patients wounded by artillery had been wounded by French artillery[A-4]. Percin adopted this figure even though it was "certainly far below reality" because it would be acceptable to all parties in the argument on the responsibility for the excess casualties[A-5]. Of the total 4,945,470 French casualties in the war 67 % were caused by artillery. Therefore the minimum cost of French artillery fire was (2.2% x 3,334,465) or 75,000[A-6]. His personal opinion was that the number of direct and indirect casualties "exceeds perhaps one million"[A-7].

2. INFANTRY SCHOOL. Percin's special estimate of 75,000 (specifically attributed to him) was picked up by *Infantry in Battle*, a case-book of small-unit actions in World War I, each narrative critiqued by the Infantry School staff[A-8]. Then - Colonel George C. Marshall was the case-book (and School) director; *Infantry in Battle* became a central training text for World War II. It also expressed (and probably set right up to our time) the paradigm of U.S. Army doctrine on friendly fire:

    a. It certainly happens: ". . it is only necessary to read the personal experiences of front-line infantry leaders to realize that all too frequently artillery does fire on its own troops"[A-9].

    b. However, artillery-on-infantry is also the limit of what is acknowledged. No other types of friendly fire occur in the U.S. narratives. (There is one narrative of infantry-on-infantry, ". . . under intense fire from their own comrades . . . one more night attack like that one and the Army will be forever demoralized," but this is a German officer describing German units[A-10].) This is unlike Percin, who recorded incidents of infantry-on-infantry, and tanks-on-infantry[A-11].

    c. It is part of war. Artillery-on-infantry casualties may occur even under conditions of good liaison, prearranged fires, and an experienced unit[A-12]. They may also be the result of a deliberate call in defense[A-13].

    d. Nevertheless, the cost is a small proportion of overall casualties. This is implicit in the transmission of Percin's special estimate; *Infantry in Battle* does not mention his opinion that "it is certainly far below reality", and it proposes no statistics of U.S. experience.

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3. TRADOC. Finally. the "2 percent" gets revalidated in 1982 by an Army schools publication, LTC Shrader's *Amicicide: the Problem of Friendly Fire in Modern War*, which begins with a discussion of Percin[A-14]. There is much that is creditable in Shrader's lead: It is apparently the first comprehensive review since Percin in any country, it offers a taxonomy which makes it clear that all arms are involved, and it contains repeated warnings of the "inadequacies of the available evidence"[A-15]. Shrader makes clear in his "Introduction" that he recognizes, for the purpose of drawing quantitative conclusions, the difference between a coherent survey and a collection of incident reports[A-16]. However, in both the "Introduction" and "Conclusion" he chooses the unsupportable and unsubstantiated: "It appears that amicicide incidents account for something less than 2 percent of all casualties in battle"[A-17]. Subsequent authors have focused on this impression; Shrader himself has retracted it [A-18].

Appendix A: Notes

(A-1) Alexander Percin, *Le Massacre de nôtre Infanterie*, Paris, Albin Michel, 1921.

(A-2)) Percin, *Massacre*, p. 14.

(A-3) Percin, *Massacre*, p. 10.

(A-4) Percin, *Massacre*, p. 217.

(A-5) Percin, *Massacre*, p. 217-8.

(A-6) Percin, *Massacre*, p. 218.

(A-7) Percin, *Massacre*, p. 57.

(A-8) United States Infantry School, *Infantry in Battle*, Washington DC, The Infantry Journal, 1939, p. viii.

(A-9) *Infantry in Battle*, p. 258.

(A-10) *Infantry in Battle*, p. 366.

(A-11) Percin, *Massacre*, p. 267.

(A-12) *Infantry in Battle*, p. 259.

(A-13) *Infantry in Battle*, p. 126.

(A-14) Shrader, *Amicicide*, p. ix-x.

(A-15) Shrader, *Amicicide*, p. 105.

(A-16) Shrader, *Amicicide*, p. xii.

(A-17) Shrader, *Amicicide*, p. 105, and vii, xii.

(A-18) Shrader interview with author, Tysons Corner, VA, November 9, 1992. Also in Robert Mackey, "Army Hopes ID Device for Vehicles Will Cut Friendly Fire Deaths", *Washington Post*, March 8, 1993: "Shrader, in an interview [with the *Post* reporter], said he would not argue with those who contend the percentage of friendly fire in past wars was higher. He said his 2 percent figure 'wasn't by any means scientifically derived. It just seemed to be the number that I kept coming up with, based on the materials that I had to work with, which were pretty limited'. His study, he said, 'was done on a rather quick basis, and the methodology is not very sound'".

Casualty surveys are statements of serious emotional and statistical power. Both powers are grounded in the same qualities of coherence, completeness, uniformity, and skill. The casualty surveys discussed in this paper share the following characteristics:

1. COHERENT DENOMINATORS. The total cases in the survey are coherent. They are the denominator in any calculation of prevalence, whether it is prevalence of a controversial event, such as friendly fire, or an uncontroversial one, such as an arm wound. The coherence may be (each over a defined period of time) a unit (Hopkins), a battle (Bougainville and ODS), one person's case-list (what Hopkins would have been but for tactical good fortune). There will probably never be, in war, a uniform coherence from survey to survey, and therefore each survey will have a different validity or applicability, but all will have a basic worth. All the casualty surveys in this paper have coherent denominators; the best is probably ODS (all battle casualties of a war), the least clear WDMET (a large collection of incidents).

2. COMPLETE DENOMINATORS. A survey reaches all cases in the denominator. If the denominator is combat casualties, all combat casualties have to be investigated. This is why the dedicated resourcing of surveys is essential; there is a very narrow interval, less than the holding period of a divisional medical treatment facility (which is usually 72 hours), within which this can be accomplished. Data collection is not an important concern of either subject units or their own medics during this time. A combination of the coherence and the completeness of the denominator is what distinguishes a survey from an incident report. WDMET is a collection of incidents, but it is a large collection, each completely studied. Percin[B-1] and Shrader are collections of incidents, each incident variably studied. Proposals to measure friendly fire casualties against denominators which can never be anywhere near complete are non-starters, because they are machines for the perpetual generation of dishonest reports[B-2].

3. UNIFORM DATA COLLECTION. This characteristic bears on the quality of each survey, and their intercomparability. All the surveys in this review exclude from their denominator persons wounded but returned immediately to duty. Each asks questions about the circumstances of wounding, and about the wounding agent, in such a way that both hostile and friendly fire are equally acceptable answers. Each requires, before attribution, a positive identification of friendly fire; the default attribution is "hostile" or "unknown." ODS is the weakest of the surveys on this standard, because the data collection on each of 613 casualties did not give them an unbiased opportunity to be identified as due to friendly or hostile fire[B-3].

4. COMPETENT INVESTIGATORS. All of these surveys are collaborations between line and medical personnel, at best (Bougainville, WDMET) including specifically prepared Ordnance and medical specialists. The weakest, again, is ODS, where the confusion of the combat commanders as the primary reporters of friendly fire, and as the possible subjects of investigation and punishment, will bias the count[B-4].

Coherence, completeness, uniformity, and competence. It may help to remember that the Vietnam Memorial is a casualty survey: It names all persons in our loss, and it orders them in time. In so doing, it says something about the structure of the war, and engages the interpretation of the living.

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Appendix B: Notes

(B-1)   Percin includes some 220 incident reports in *Massacre*, pp. 18-40 and 221-96. Any attempt to understand the complexity and breadth of the friendly fire problem most efficiently begins with a reading of Shrader and Percin.

(B-2)   For example, the proposal to use as denominator "the total number of enemy and friendly casualties we inflicted" (*CALL Newsletter*, No. 92-4, April 92, p. 5, emphasis in original), or the application of similar reasoning in an *Army Times* editorial, "Americans killing Americans" (August 26, 1991).

(B-3)   Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs), transcript of DoD News Briefing "Friendly Fire Incidents, August 13, 1991", pp.11, 13-14, 16, 20. Cited as "DoD Friendly Fire Briefing, August 13, 1991".

(B-4)   DoD Friendly Fire Briefing, August 13, 1991, pp. 7-9, 18-19.

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